CLAIMS

What is claimed is:

1. A method of recovery from a data storage system failure in a data storage system having a host computer writing updates to a local storage controller associated with a local storage device at a local site, the local storage controller asynchronously copying the updates to a remote storage controller at a remote site the remote storage controller storing the updates on a remote storage device and periodically storing a consistent point in time copy of the updates on a backup storage device, the method comprising:

>   detecting a failure associated with the local site;

>   determining whether a consistent point in time copy of the updates pending for storage on the backup storage device at the time the failure is detected form an intact consistency group;

>   correcting the failure associated with the local site; and

>   re-synchronizing the local storage device.

2. The method of claim 1 further comprising the following steps upon detecting the failure associated with the local site:

>   terminating the asynchronous copying of updates from the local storage controller to the remote storage controller;

>   establishing a reverse asynchronous update copying relationship from the remote storage controller to the local storage controller; and

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quiescing the host computer.

3.   The method of claim 1 further comprising taking corrective action on the updates pending for storage on the backup device to create an intact consistency group.

4.   The method of claim 3 wherein the corrective action taken is selected from a group of actions consisting of completing a pending consistency group, withdrawing the pending consistency group, reverting to a prior intact consistency group and allowing the pending consistency group to become the intact consistency group.

5.   The method of claim 4 further comprising physically copying to the backup storage device the updates in the intact consistency group, thereby forming a recovery consistency group.

6.   The method of claim 5 further comprising synchronizing the updates stored on the remote storage device with the updates of the recovery consistency group.

7.   The method of claim 6 further comprising writing post-failure updates directly to the remote storage controller.

8.   The method of claim 7 wherein the post-failure updates are written to the remote storage controller from a remote host.

9.   The method of claim 7 wherein re-synchronizing the local storage device comprises synchronizing the local storage device with the recovery consistency group and the post-failure updates by the asynchronous copying of updates from the recovery storage controller to the local recovery controller.

10.   The method of claim 7 further comprising the following steps after the local storage device is re-synchronized:

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quiescing the recovery host;

terminating the asynchronous copying of updates from the remote storage controller to the local storage controller;

re-establishing the asynchronous copy relationship from the local storage controller to the remote storage controller; and

storing a new consistent copy of the data on the remote storage device to the backup storage device.

11.   The method of claim 10 wherein storing a new consistent copy of the data on the remote storage device to the backup storage device comprises merging post-failure updates written to the remote storage volume with the recovery consistency group on the backup storage device.

12.   A system for copying stored data and having the ability to recover from a failure comprising:

means for detecting a failure associated with a local storage site having a local storage controller and a local storage device;

means for re-synchronizing the local storage device after the failure is corrected; and

a remote storage controller having:

means for asynchronously receiving updates from the local storage controller;

means for writing the updates to a remote storage device

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means for storing a consistent point in time copy of the updates on a backup storage device;

means for determining whether a group of pending updates for storage on the backup storage device form an intact consistency group, upon detection of the failure associated with the local site.

13. The system for copying stored data of claim 12 wherein the remote storage controller further comprises means for taking corrective action on the group of pending updates to create an intact consistency group.

14. The system for copying stored data of claim 13 wherein the corrective action is selected from a group of actions consisting of completing a pending consistency group, withdrawing the pending consistency group, reverting to a prior intact consistency group and allowing the pending consistency group to become the intact consistency group.

15. The system for copying stored data of claim 14 further comprising a recovery consistency group physically stored on the backup storage device, formed from the intact consistency group.

16. The system for copying stored data of claim 15 further comprising a remote host.

17. The system for copying stored data of claim 16 wherein the remote storage controller receives post-failure data updates from the remote host.

18. The system for copying stored data of claim 17 wherein the means for re-synchronizing the local storage device after the failure is corrected comprises the asynchronous copying of post-failure updates and updates in the recovery consistency group from the remote storage controller to the local storage controller.

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19. The system for copying stored data of claim 17 wherein the remote storage controller further comprises means for merging post-failure updates written to the remote storage device with the recovery consistency group on the backup storage device, creating a new consistency group.

20. An article of manufacture for use in programming a data storage system to recover from a failure, the data storage system having a host computer writing updates to a local storage controller associated with a local storage device, at a local site having a local storage device, the local storage controller asynchronously copying the updates to a remote storage controller at a remote site the remote storage controller storing the updates on a remote storage device and periodically storing a consistent point in time copy of the updates on a backup storage device, the article of manufacture comprising a storage medium having logic embedded therein to cause components of the data storage system to:

> detect a failure associated with the local site;

> determine whether a consistent point in time copy of the updates pending for storage on the backup storage device at the time the failure is detected form an intact consistency group;

> correct the failure associated with the local site; and

> re-synchronize the local storage device.

21. The article of manufacture of claim 20 wherein the logic further causes components of the data storage system to take the following steps upon detecting the failure associated with the local site:

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terminate the asynchronous copying of updates from the local storage controller to the remote storage controller;

establish a reverse asynchronous update copying relationship from the remote storage controller to the local storage controller; and

quiesce the host computer.

22.   The article of manufacture of claim 20 wherein the logic further causes components of the data storage system to take corrective action on the updates pending for storage on the backup storage device to create an intact consistency group.

23.   The article of manufacture of claim 22 wherein the corrective action taken is selected from a group of actions consisting of completing a pending consistency group, withdrawing the pending consistency group, reverting to a prior intact consistency group and allowing the pending consistency group to become the intact consistency group.

24.   The article of manufacture of claim 23 wherein the logic further causes components of the data storage system to physically copy to the backup storage device the updates in the intact consistency group, thereby forming a recovery consistency group.

25.   The article of manufacture of claim 24 wherein the logic further causes components of the data storage system to synchronize the updates stored on the remote storage device with the updates of the recovery consistency group.

26.   The article of manufacture of claim 25 wherein the logic further causes components of the data storage system to write post-failure updates directly to the remote storage controller.

27.   The article of manufacture of claim 26 wherein the logic further causes components of the data storage system to write the post-failure updates to the remote storage controller from a remote host.

28.   The article of manufacture of claim 26 wherein the logic further causes components of the data storage system to re-synchronize the local storage device by synchronizing the local storage device with the recovery consistency group and the post-failure updates through the asynchronous copying of the updates from the recovery storage controller to the local recovery controller.

29.   The article of manufacture of claim 26 wherein the logic further causes components of the data storage system to take the following steps after the local storage device is re-synchronized:

        quiesce the recovery host;

        terminate the asynchronous copying of updates from the remote storage controller to the local storage controller;

        re-establish the asynchronous copy relationship from the local storage controller to the remote storage controller; and

        store a new consistent copy of the data on the remote storage device to the backup storage device.

30.   The article of manufacture of claim 29 wherein the logic further causes components of the data storage system to form a new consistent copy of the data stored on the remote storage device on the backup storage device by merging post-failure updates written to the remote storage volume with the recovery consistency group on the backup storage device.